

09/673836

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| FORM PTO-1390 (Modified) (REV 5-93) | | U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE | | ATTORNEY'S DOCKET NUMBER | |
| TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371 | | | | 085933/0117 | |
| | | | | U.S. APPLICATION NO. (If known, see 37 C.F.R. 1.5) unassigned | |
| INTERNATIONAL APPLICATION NO. PCT/EP99/02715 | | INTERNATIONAL FILING DATE April 22, 1999 | | PRIORITY DATE CLAIMED April 23, 1998 | |
| TITLE OF INVENTION A PROCESS FOR THE CONVERSION OF ECHINOCANDIN CLASS OF PEPTIDES TO THEIR C4-HOMOTYROSINE MONODEOXY ANALOGUES | | | | | |
| APPLICANT(S) FOR DO/EO/US Triptikumar MUKHOPADHYAY; Kenia JAYVANTI; Erra Koteswara Satya Vijaya KUMAR. | | | | | |
| Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information: | | | | | |
| 1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371. 2. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371. 3. <input type="checkbox"/> This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1). 4. <input checked="" type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19 th month from the earliest claimed priority date. 5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2)) <input checked="" type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau). <input type="checkbox"/> has been transmitted by the International Bureau. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US) 6. <input type="checkbox"/> A translation of the International Application into English (35 U.S.C. 371(c)(2)). 7. <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)) <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau). <input type="checkbox"/> have been transmitted by the International Bureau. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired. <input checked="" type="checkbox"/> have not been made and will not be made. 8. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)). 9. <input type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). 10. <input type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)). Items 11. to 16. below concern other document(s) or information included: 11. <input type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98. 12. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included. 13. <input checked="" type="checkbox"/> A FIRST preliminary amendment. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment. 14. <input type="checkbox"/> A substitute specification. 15. <input type="checkbox"/> A change of power of attorney and/or address letter. 16. <input type="checkbox"/> Other items or information: | | | | | |

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|---|--------------|--|--------------|--------------------------------------|--|
| U.S. APPLICATION NO. (If known, see 37 C.F.R. 1.50 unassigned) 09/673836 | | INTERNATIONAL APPLICATION NO. PCT/EP99/02715 | | ATTORNEY'S DOCKET NUMBER 085933/0117 | |
| 17. <input checked="" type="checkbox"/> The following fees are submitted: | | | | CALCULATIONS | |
| Basic National Fee (37 CFR 1.492(a)(1)-(5): Search Report has been prepared by the EPO or JPO.....\$860.00 | | | | \$860.00 | |
| International preliminary examination fee paid to USPTO (37 CFR 1.482).....\$690.00 | | | | | |
| No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2))\$710.00 | | | | | |
| Neither international preliminary examination fee (37 CFR 1.482) nor International search fee (37 CFR 1.445(a)(2)) paid to USPTO \$1000.00 | | | | | |
| International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4)\$100.00 | | | | | |
| ENTER APPROPRIATE BASIC FEE AMOUNT = | | | | \$860.00 | |
| Surcharge of \$130.00 for furnishing the oath or declaration later than 20 Months from the earliest claimed priority date (37 CFR 1.492(e)) | | | | | |
| Claims | Number Filed | Included in Basic Fee | Extra Claims | Rate | |
| Total Claims | 4 | 20 | | \$18.00 | |
| Independent Claims | 1 | 3 | | \$80.00 | |
| Multiple dependent claim(s) (if applicable) | | | | \$270.0 | |
| TOTAL OF ABOVE CALCULATIONS = | | | | \$860.00 | |
| Reduction by 1/2 for filing by small entity, if applicable. Verified Small Entity statement must also be filed. (Note 37 CFR 1.9, 1.27, 1.28). | | | | \$0.00 | |
| SUBTOTAL = | | | | \$860.00 | |
| Processing fee of \$130.00 for furnishing English translation later the 20 months from the earliest claimed priority date (37 CFR 1.492(f)). | | | | + | |
| TOTAL NATIONAL FEE = | | | | \$860.00 | |
| Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property + | | | | | |
| TOTAL FEES ENCLOSED = | | | | \$860.00 | |
| | | | | Amount to be: refunded \$ | |
| | | | | charged \$ | |
| <p>a. <input checked="" type="checkbox"/> A check in the amount of \$860.00 to cover the above fees is enclosed.</p> <p>b. <input type="checkbox"/> Please charge my Deposit Account No. <u>19-0741</u> in the amount of \$1460.00 to the above fees. A duplicate copy of this sheet is enclosed.</p> <p>c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. <u>19-0741</u>. A duplicate copy of this sheet is enclosed.</p> | | | | | |
| <p>NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.</p> | | | | | |
| <p>SEND ALL CORRESPONDENCE TO:</p> <p>Foley & Lardner 3000 K Street, N.W. Suite 500 Washington, DC 20007-5109</p> <p><i>October 23, 2000</i></p> | | | | | |
| <p><i>Patricia D. Granados</i> SIGNATURE</p> <p>NAME PATRICIA D. GRANADOS</p> <p>REGISTRATION NUMBER 33,683</p> | | | | | |

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Attorney Docket No. 085933/0117

In re patent application of
MUKHOPADHYAY et al.

Serial No.: Unassigned

Group Art Unit: Unassigned

Filed: October 23, 2000

Examiner: Unassigned

For: A PROCESS FOR THE CONVERSION OF ECHINOCANDIN CLASS
OF PEPTIDES TO THEIR C4-HOMOTYROSINE MONODEOXY
ANALOGUES

PRELIMINARY AMENDMENT

Assistant Commissioner of Patents
Washington, D.C. 20231
Box Patent Application

Sir:

Prior to examination on the merits of the above-identified application, please amend
the applications as follows:

IN THE CLAIMS

Please amend the claims as follows:

3. (Amended) A process as claimed in [claims 1 to 3] claim 1, wherein the reduction
reaction is carried out by hydrogenolysis with Raney nickel in ethanol at pH7 and room
temperature.

4. (Amended) A process as claimed in [claims 1 to 3] claim 3, wherein the
hydrogenolysis is carried out in the ratio of 6.8 ml of Raney nickel per millimole of
mulundocandin.

REMARKS

Applicants respectfully request entry of the foregoing amendment prior to the
examination on the merits of the instant application. Should the Examiner have any
questions or comments regarding the pending application or this preliminary amendment,

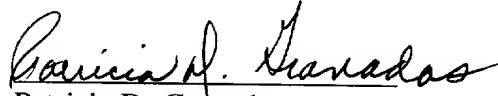
the Examiner is requested to call the undersigned.

If there are any fees due in connection with the filing of this Preliminary Amendment, please charge the fees to our Deposit Account No. 19-0741. If a fee is required for an extension of time under 37 C.F.R. § 1.136 not accounted for above, such an extension is requested and the fee should also be charged to our Deposit Account.

Respectfully submitted,

October 23, 2000

Date



Patricia D. Granados

Reg. No. 33,683

FOLEY & LARDNER

Suite 500, 3000 K Street, N.W.

Washington, D.C. 20007-5109

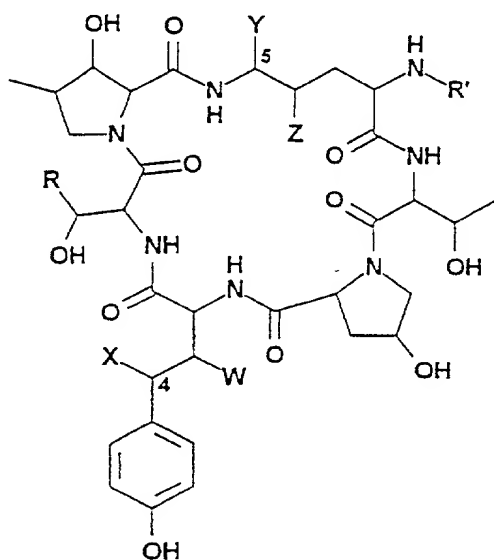
(202) 672-5300

Should additional fees be necessary in connection with the filing of this paper, or if a petition for extension of time is required for timely acceptance of same, the Commissioner is hereby authorized to charge Deposit Account No. 19-0741 for any such fees; and applicant(s) hereby petition for any needed extension of time.

A process for the conversion of echinocandin class of peptides to their C4-homotyrosine monodeoxy analogues

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This invention relates to a process for the conversion of echinocandin class of peptides of the formula I



(I)

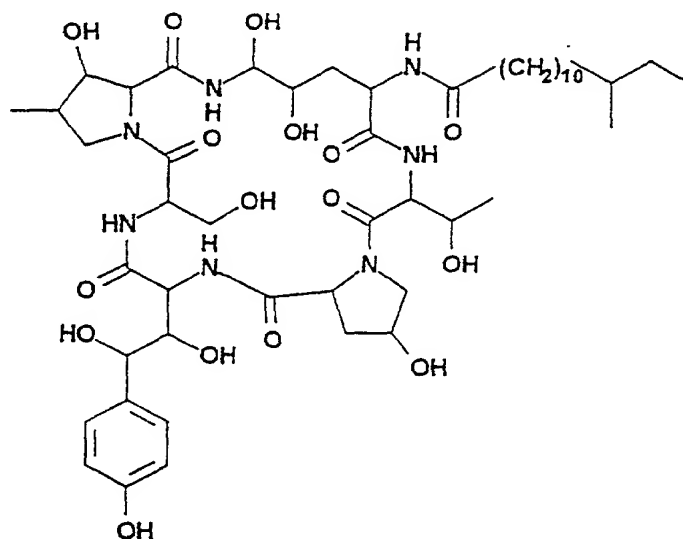
10 wherein W, X, Y, Z, R and R' are as defined herein below :

| | | <u>W</u> | <u>X</u> | <u>Y</u> | <u>Z</u> | <u>R</u> | <u>R'</u> |
|----|-----------------------------|----------|----------|----------|----------|------------------------------------|------------------------------|
| 1. | Echinocandin B | OH | OH | OH | OH | CH ₃ | Linoleoyl |
| 2. | Pneumocandin A ₀ | OH | OH | OH | OH | CH ₂ -CONH ₂ | 10,12-Dimethyl- myristoyl |
| 3. | Pneumocandin A ₁ | H | OH | OH | OH | CH ₂ -CONH ₂ | " |
| 4. | Pneumocandin A ₂ | OH | OH | H | H | CH ₂ -CONH ₂ | " |
| 5. | Pneumocandin B ₀ | OH | OH | OH | OH | CH ₂ -CONH ₂ | " |
| 6. | Pneumocandin B ₂ | OH | OH | H | H | CH ₂ -CONH ₂ | " |
| 7. | Pneumocandin C ₀ | OH | OH | OH | OH | CH ₂ -CONH ₂ | " |
| 8. | Mulundocandin | OH | OH | OH | OH | H | 12-Methyl- tetradecanoyl |

to their C4-homotyrosine monodeoxy analogues of the formula I, wherein W, X, Y, Z, R and R' are as defined herein below:

| | | <u>W</u> | <u>X</u> | <u>Y</u> | <u>Z</u> | <u>R</u> | <u>R'</u> |
|----|--|----------|----------|----------|----------|-------------------------------------|-------------------------------|
| 5 | 1. Deoxyechinocandin B (Echinocandin C) | OH | H | OH | OH | CH ₃ | Linoleoyl |
| | 2. Deoxypneumocandin A ₀ Dimethyl- | OH | H | OH | OH | CH ₂ -CO-NH ₂ | 10,12- |
| 10 | | | | | | | myristoyl |
| | 3. Deoxypneumocandin A ₁ | H | H | OH | OH | CH ₂ -CONH ₂ | " |
| | 4. Deoxypneumocandin A ₂ | OH | H | H | H | CH ₂ -CONH ₂ | " |
| | 5. Deoxypneumocandin B ₀ | OH | H | OH | OH | CH ₂ -CONH ₂ | " |
| | 6. Deoxypneumocandin B ₂ | OH | H | H | H | CH ₂ -CONH ₂ | " |
| 15 | 7. Deoxypneumocandin C ₀ | OH | H | OH | OH | CH ₂ -CONH ₂ | " |
| | 8. Deoxymulundocandin | OH | H | OH | OH | H | 12-Methyl tetra- decanoyl, |

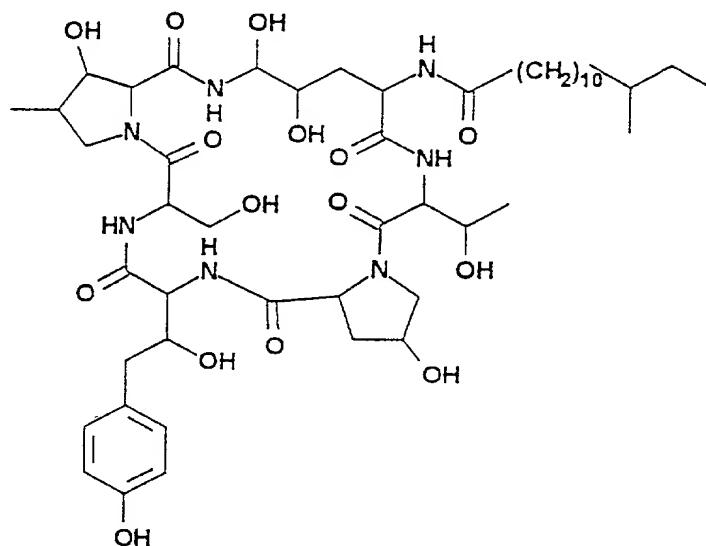
particularly to a process for the conversion of mulundocandin (compound of the formula II)



(II)

to deoxymulundocandin (compound of the formula III)

5



(III)

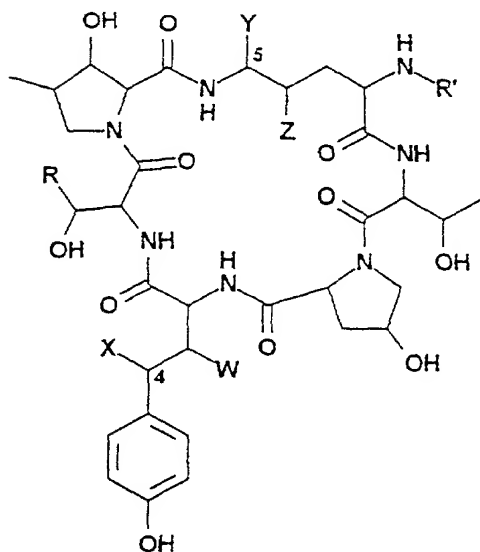
1,3- β -glucan synthesis inhibitors are effective antifungal agents against *Candida albicans* and also *Pneumocystis carini*, an opportunistic organism responsible for an often fatal pneumonitis among HIV patients and other immunocompromised hosts. Of all the structural classes of 1,3- β -glucan synthesis inhibitors, only the echinocandins received considerable attention [Ref : J. Med. Chem. 35, 198-200 (1992)]. Echinocandin class of peptides are cyclic hexapeptides having a lipophilic side chain.

Several methods for the conversion of echinocandins to the corresponding deoxy analogues under acidic conditions have been reported [Ref : Tetrahedron Letts., 33, 4529-4532 (1992); US Patent Appl. No. 222157 dated April 4, 1994]. The above methods involve selective reduction of C4-htyr (homotyrosine) hydroxyl group of echinocandins to their monodeoxy analogues with prior protection / deprotection of the equally facile C5-Orn (ornithine) hydroxyl group.

Mulundocandin [J.Antibiotics, 40, 275-280 and 281-289 (1987)] and deoxymulundocandin [Indian patent No. IN 169830 ; J.Antibiotics, 45, 618-623 (1992)] having antifungal properties were isolated from *Aspergillus sydowii* (Bainier and Sartory) Thom and Church var. Nov. *Mulundensis* Roy (culture no.HIL Y-30462). Deoxymulundocandin was found to possess better antifungal activity than mulundocandin. However, the production of deoxymulundocandin during the fermentation was 200 times less than that of mulundocandin.

We have found out by extensive research and experimentation that echinocandin class of peptides of the formula I may be converted to the corresponding C4-htyr monodeoxy analogues, particularly mulundocandin to deoxymulundocandin under neutral conditions. Accordingly, the object of the present invention is to provide a process for the conversion of echinocandin class of peptides of the formula I to the corresponding C4-homotyrosin monodeoxy analogues, particularly mulundocandin (compound of formula II) to deoxymulundocandin (compound of formula III).

According to the invention, there is provided a process for the conversion of echinocandin class of peptides of the formula I



wherein W, X, Y, Z, R and R' are as defined herein below :

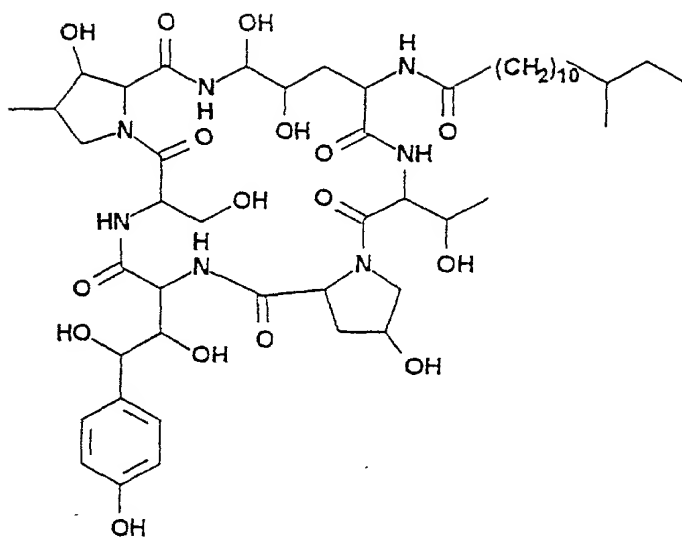
| | | <u>W</u> | <u>X</u> | <u>Y</u> | <u>Z</u> | <u>R</u> | <u>R'</u> |
|----|--------------------------------|----------|----------|----------|----------|-------------------------------------|------------------------------|
| 5 | 1. Echinocandin B | OH | OH | OH | OH | CH ₃ | Linoleoyl |
| | 2. Pneumocandin A ₀ | OH | OH | OH | OH | CH ₂ -CO-NH ₂ | 10,12-Dimethyl- myristoyl |
| | 3. Pneumocandin A ₁ | H | OH | OH | OH | CH ₂ -CO-NH ₂ | " |
| | 4. Pneumocandin A ₂ | OH | OH | H | H | CH ₂ -CO-NH ₂ | " |
| 10 | 5. Pneumocandin B ₀ | OH | OH | OH | OH | CH ₂ -CO-NH ₂ | " |
| | 6. Pneumocandin B ₂ | OH | OH | H | H | CH ₂ -CO-NH ₂ | " |
| | 7. Pneumocandin C ₀ | OH | OH | OH | OH | CH ₂ -CO-NH ₂ | " |
| | 8. Mulundocandin | OH | OH | OH | OH | H | 12-Methyl- tetradecanoyl |

15

to their C4-homotyrosine monodeoxy analogues of the formula I, wherein W, X, Y, Z, R and R' are as defined herein below:

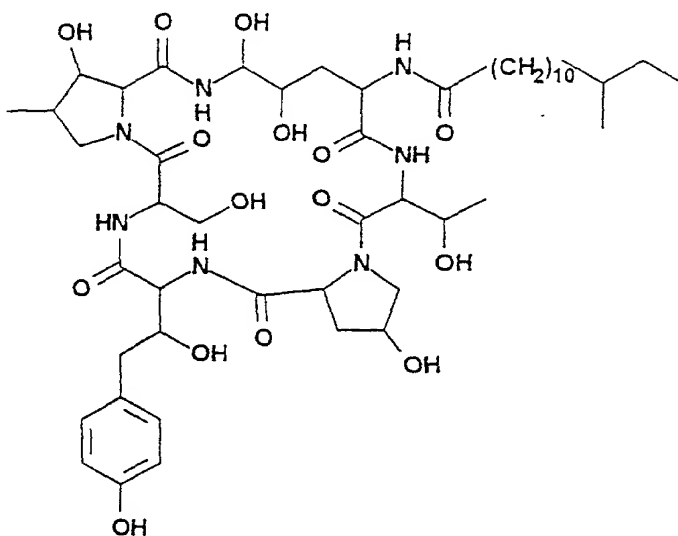
| | | <u>W</u> | <u>X</u> | <u>Y</u> | <u>Z</u> | <u>R</u> | <u>R'</u> |
|----|--|----------|----------|----------|----------|-------------------------------------|------------------------------|
| 20 | 1. Deoxyechinocandin B (Echinocandin C) | OH | H | OH | OH | CH ₃ | Linoleoyl |
| | 2. Deoxypneumocandin A ₀ | OH | H | OH | OH | CH ₂ -CO-NH ₂ | 10,12-Dimethyl- myristoyl |
| | 3. Deoxypneumocandin A ₁ | H | H | OH | OH | CH ₂ -CO-NH ₂ | " |
| 25 | 4. Deoxypneumocandin A ₂ | OH | H | H | H | CH ₂ -CO-NH ₂ | " |
| | 5. Deoxypneumocandin B ₀ | OH | H | OH | OH | CH ₂ -CO-NH ₂ | " |
| | 6. Deoxypneumocandin B ₂ | OH | H | H | H | CH ₂ -CO-NH ₂ | " |
| | 7. Deoxypneumocandin C ₀ | OH | H | OH | OH | CH ₂ -CO-NH ₂ | " |
| 30 | 8. Deoxymulundocandin | OH | H | OH | OH | H | 12-Methyl tetra- decanoyl |

6
particularly to a process for the conversion of mulundocandin (compound of the formula II



(II)

to deoxymulundocandin (compound of the formula III)



which consists of a single step selective reduction of C4-htyr (homotyrosine)
hydroxyl group of echinocandins to their monodeoxy analogues particularly under
neutral conditions without prior protection / deprotection of the equally facile C5-Orn
(ornithine) hydroxyl group and purification of the monodeoxy compound from the
5 crude reaction mixture.

The conversion of echinocandins to their monodeoxy analogues by selective
reduction at C4-htyr may be effected by hydrogenolysis with Raney nickel in
solvents such as methanol, ethanol, or dioxane at pH 3-9. Preferably, the selective
10 reduction is carried out by hydrogenolysis with Raney nickel in ethanol at pH 7 and
room temperature in the ratio of 6.8 ml Raney nickel per millimole of mulundocandin.

The monodeoxy compounds of the invention may, for example, be purified from the
crude reaction mixture as follows :

15 By fractionation using normal phase chromatography (using alumina or silica gel as
stationary phase and eluents such as petroleum ether, ethyl acetate,
dichloromethane, chloroform, methanol or combinations thereof), reverse phase
chromatography (using reverse phase silica gel like dimethyloctadecylsilylsilica gel,
20 also called RP-18 or dimethyloctylsilylsilica gel also called RP-8 as stationary phase
and eluents such as water, buffers such as phosphate, acetate, citrate (pH 2-8) and
organic solvents such as methanol, acetonitrile, acetone, tetrahydrofuran or
combination of the solvents), gel permeation chromatography - using resins such as
"Sephadex LH-20[®]" (Pharmacia Chemical Industries, Sweden), TSKgel Toyopearl
25 HW (TosoHaas, Tosoh Corporation, Japan) in solvents such as methanol,
chloroform or ethyl acetate or their combination or Sephadex G-10 and G-25 in
water; or by counter-current chromatography using a biphasic eluent system made
up of two or more solvents such as water, methanol, ethanol, *iso*-propanol, *n*-
propanol, tetrahydrofuran, acetone, acetonitrile, methylene chloride, chloroform,
30 ethylacetate, petroleum ether, benzene and toluene. These techniques may be used
repeatedly or a combination of the different techniques may be used. Counter-

current chromatography (liquid-liquid⁸ chromatography) using a biphasic eluent system on ITO coil is preferred for purification of the compounds of the invention.

The following experimental example is illustrative of the present invention but not
5 limitative of the scope thereof.

Example 1

Mulundocandin (220 mg, 2.2 mM) in ethanol (8 ml)) was stirred with 15 ml of W-2
Raney nickel (pH 7) in ethanol (30 ml) for 3 hours at room temperature. After
10 standing for 15 minutes the supernatant solution was decanted and Raney nickel
washed with 3 x 30 ml. ethanol with stirring and filtered. Combined ethanolic
solutions were concentrated by distillation under a reduced pressure of 60-70
mm/Hg at 35° C to obtain 160 mg (75%) of crude deoxymulundocandin as a slightly
green solid.

15 The crude product was purified by liquid-liquid chromatography on ITO coil using
upper layer of CH₂Cl₂ : MeOH : *n*-PrOH : H₂O as the stationary phase and the lower
layer as the mobile phase in an ascending mode. The coils (15 + 25 + 215 ml) were
connected in series and a flow rate of 0.6 ml/min. at a piston stroke of 60 and
20 pressure 0.5 bars was maintained. The purification of deoxymulundocandin was
monitored both by bioactivity against *Candida albicans* and *Aspergillus niger* and by
analytical High Pressure Liquid Chromatography (HPLC) [column : (10 x 0.4 cm + 3
x 0.4 cm) ODS-Hypersil, 10μ; mobile phase: 50:50 CH₃CN : H₂O ; flow rate : 1
ml/min; Wavelength : 220 nm.) The fractions (4.5 ml each) containing
25 deoxymulundocandin were combined, concentrated by distillation under a reduced
pressure of 60-70 mm/Hg at 35°C and lyophilized to yield pure
deoxymulundocandin [65 mg (30% yield)]. Also recovered during the above
purification of deoxymulundocandin was unreacted mulundocandin in 10% yield.

30 The semi-synthetic deoxymulundocandin was identical in all respects to the
naturally isolated compound and the physico-chemical data is given in Table 1.

TABLE 1

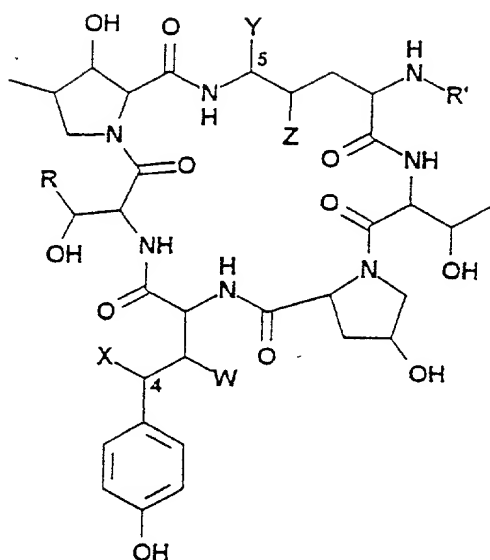
| | |
|----|---|
| 5 | ----- |
| | Appearance : White powder |
| | Melting point: 170-172°C |
| | $[\alpha]_D$: - 36.6° (c 0.25, MeOH) |
| | HPLC RT : 4.42 min |
| 10 | FAB-MS (Fast Atom Bombardment mass): 1014.7 (M + Na) ⁺ |
| | ¹ H NMR (300 MHz, : <u>Figure 1 of the accompanying drawings</u> |
| | CD ₃ OD) |
| | ¹³ C NMR (75 MHz, : <u>Figure 2 of the accompanying drawings</u> |
| 15 | CD ₃ OD) |
| | ----- |

Claims:

1. A process for the conversion of echinocandin class of peptides of the formula

5

I



(I)

wherein W, X, Y, Z, R and R' are as defined herein below :

10

| | | <u>W</u> | <u>X</u> | <u>Y</u> | <u>Z</u> | <u>R</u> | <u>R'</u> |
|----|--------------------------------|----------|----------|----------|----------|-------------------------------------|------------------------------|
| | 1. Echinocandin B | OH | OH | OH | OH | CH ₃ | Linoleoyl |
| | 2. Pneumocandin A ₀ | OH | OH | OH | OH | CH ₂ -CO-NH ₂ | 10,12-Dimethyl- myristoyl |
| 15 | 3. Pneumocandin A ₁ | H | OH | OH | OH | CH ₂ -CO-NH ₂ | " |
| | 4. Pneumocandin A ₂ | OH | OH | H | H | CH ₂ -CO-NH ₂ | " |
| | 5. Pneumocandin B ₀ | OH | OH | OH | OH | CH ₂ -CO-NH ₂ | " |
| | 6. Pneumocandin B ₂ | OH | OH | H | H | CH ₂ -CO-NH ₂ | " |
| | 7. Pneumocandin C ₀ | OH | OH | OH | OH | CH ₂ -CO-NH ₂ | " |
| 20 | 8. Mulundocandin | OH | OH | OH | OH | H | 12-Methyl- tetradecanoyl |

to their C4-homotyrosine monodeoxy analogues of the formula I, wherein W, X, Y, Z, R and R' are as defined herein below

| | | <u>W</u> | <u>X</u> | <u>Y</u> | <u>Z</u> | <u>R</u> | <u>R'</u> |
|----|--|----------|----------|----------|----------|-------------------------------------|------------------------------|
| 5 | 1. Deoxyechinocandin B (Echinocandin C) | OH | H | OH | OH | CH ₃ | Linoleoyl |
| | 2. Deoxypneumocandin A ₀ | OH | H | OH | OH | CH ₂ -CO-NH ₂ | 10,12-Dimethyl- myristoyl |
| | 3. Deoxypneumocandin A ₁ | H | H | OH | OH | CH ₂ -CONH ₂ | " |
| 10 | 4. Deoxypneumocandin A ₂ | OH | H | H | H | CH ₂ -CONH ₂ | " |
| | 5. Deoxypneumocandin B ₀ | OH | H | OH | OH | CH ₂ -CONH ₂ | " |
| | 6. Deoxypneumocandin B ₂ | OH | H | H | H | CH ₂ -CONH ₂ | " |
| | 7. Deoxypneumocandin C ₀ | OH | H | OH | OH | CH ₂ -CONH ₂ | " |
| 15 | 8. Deoxymulundocandin | OH | H | OH | OH | H | 12-Methyl tetra- decanoyl |

which consists of a single step selective reduction of C4-htyr (homotyrosine) hydroxyl group of echinocandins to their monodeoxy analogues under neutral conditions without prior protection / deprotection of the equally facile C5-Orn (ornithine) hydroxyl group and purification of the monodeoxy compound from the crude reaction mixture.

2. A process as claimed in claim 1, wherein Mulundocandin is converted to Deoxymulundocandin.

3. A process as claimed in claims 1 or 2, wherein the reduction reaction is carried out by hydrogenolysis with Raney nickel in ethanol at pH 7 and room temperature.

4. A process as claimed in claims 1 to 3, wherein the hydrogenolysis is carried out in the ratio of 6.8 ml of Raney nickel per millimole of mulundocandin.

1/2

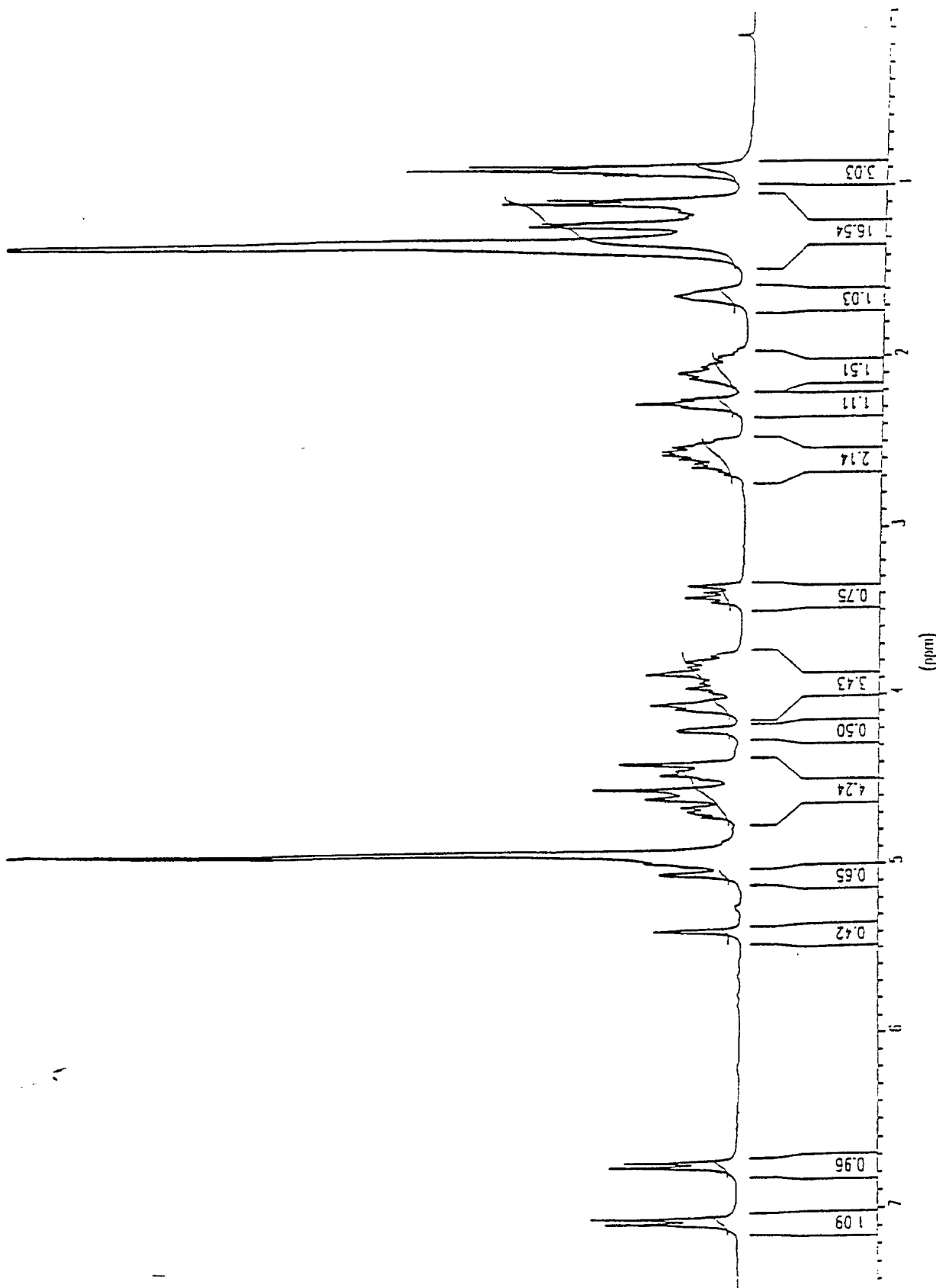


Fig. 1

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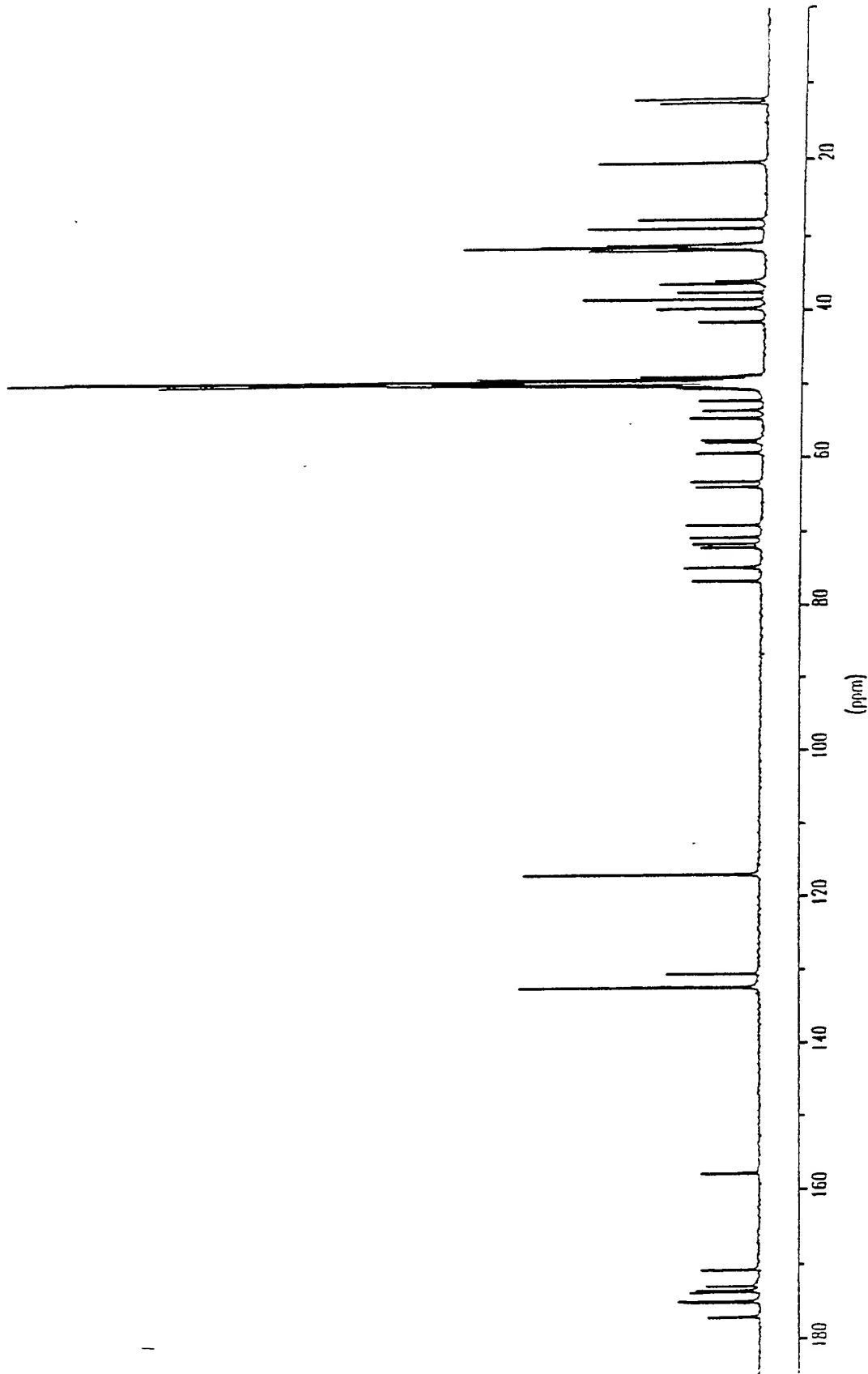


Fig. 2

29 MAR 2001

DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I HEREBY DECLARE:

THAT my residence, post office address, and citizenship are as stated below next to my name;

THAT I believe I am the original, first, and sole inventor (if only one inventor is named below) or an original, first, and joint inventor (if plural inventors are named below or in an attached Declaration) of the subject matter which is claimed and for which a patent is sought on the invention entitled

**A PROCESS FOR THE CONVERSION OF ECHINOCANDIN CLASS OF
PEPTIDES TO THEIR C4-HOMOTYROSINE MONODEOXY ANALOGUES**

(Attorney Docket No. 085933/0117)

the specification of which (check one)

☐ is attached hereto.

☒ was filed April 22, 1999 as PCT International Application Number
PCT/EP99/02715

THAT I do not know and do not believe that the same invention was ever known or used by others in the United States of America, or was patented or described in any printed publication in any country, before I (we) invented it;

THAT I do not know and do not believe that the same invention was patented or described in any printed publication in any country, or in public use or on sale in the United States of America, for more than one year prior to the filing date of this United States application;

THAT I do not know and do not believe that the same invention was first patented or made the subject of an inventor's certificate that issued in any country foreign to the United States of America before the filing date of this United States application if the foreign application was filed by me (us), or by my (our) legal representatives or assigns, more than twelve months (six months for design patents) prior to the filing date of this United States application;

THAT I have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment specifically referred to above;

THAT I believe that the above-identified specification contains a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention, and sets forth the best mode contemplated by me of carrying out the invention; and

THAT I acknowledge the duty to disclose to the U.S. Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I HEREBY CLAIM foreign priority benefits under Title 35, United States Code § 119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below any foreign application for patent or inventor's certificate or of any PCT international application having a filing date before that of the application on which priority is claimed.

| Prior Foreign Application Number | Country | Foreign Filing Date | Priority Claimed? | Certified Copy Attached? |
|----------------------------------|---------|---------------------|-------------------|--------------------------|
| 98107397.6 | EP | April 23, 1998 | yes | no |
| | | | | |
| | | | | |

I HEREBY CLAIM the benefit under Title 35, United States Code § 119(e) of any United States provisional application(s) listed below.

| U.S. Provisional Application Number | Filing Date |
|-------------------------------------|-------------|
| | |
| | |
| | |

I HEREBY CLAIM the benefit under Title 35, United States Code, § 120 of any United States application(s), or § 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

| U.S. Parent Application Number | PCT Parent Application Number | Parent Filing Date | Parent Patent Number |
|--------------------------------|-------------------------------|--------------------|----------------------|
| | | | |
| | | | |
| | | | |

I HEREBY APPOINT the following registered attorneys and agents of the law firm of FOLEY & LARDNER:

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to have full power to prosecute this application and any continuations, divisions, reissues, and reexaminations thereof, to receive the patent, and to transact all business in the United States Patent and Trademark Office connected therewith.

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I UNDERSTAND AND AGREE THAT the foregoing attorneys and agents appointed by me to prosecute this application do not personally represent me or my legal interests, but instead represent the interests of the legal owner(s) of the invention described in this application.

I FURTHER DECLARE THAT all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

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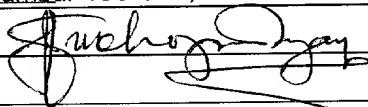
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